

## Claims

We claim:

- 1) An apparatus comprising a rotating tool that is monolithic with a shaft and a fluid film bearing system wherein the fluid film bearing system comprises two thrust bearings at both coaxial surfaces of the blade and further comprising two journal bearings positioned at the shaft.
- 2) The apparatus of claim 1, designed for balanced high-speed rotation.
- 3) The high speed rotation apparatus of claim 2, wherein said rotating tool is a disc.
- 4) The apparatus of claim 2, wherein said rotating tool is a rotor.
- 5) The apparatus of claim 2, wherein said rotating tool is a cutter.
- 6) The apparatus of claim 2, wherein said rotating tool is a drum.
- 7) The apparatus of claim 2, wherein said rotating tool comprises magnets.
- 8) The apparatus of claim 2, wherein said rotating tool comprises an illumination source.
- 9) The apparatus of claim 2, wherein said rotating tool comprises sensor for high speed detection or high speed imaging.
- 10) The apparatus of claim 1 to 8, wherein said apparatus is an high-speed cutting tool
- 11) The apparatus of claim 1 to 8, wherein said apparatus is a high-speed imaging tool.
- 12) The apparatus of claim 1 to 11, characterised in that during rotation better process stability is achieved than  
with conventional machinery.
- 13) The apparatus of claim 1 to 11, characterised in that during rotation better precision and process reliability is  
achieved than with conventional machinery.
- 14) The use of said apparatus of claim 10 for high-speed cutting.
- 15) The use of said apparatus of claim 11 for high-speed photography.
- 16) The apparatus of any of the claims 1 to 15, characterised in that said apparatus is driven by a motor mounted on a different axis.

- 17) The apparatus of any of the claims 1 to 15, characterised in that said apparatus is driven by a motor mounted on the same axis.
- 18) The apparatus of any of the claims 1 to 15, characterised in that said apparatus is driven by an electric motor.
- 19) The apparatus of any of the claims 1 to 15, characterised in that said apparatus is driven by a turbine.
- 20) A high precision and high speed rotation device, comprising 1) a fluid (gas or liquid) bearing system which is a combined journal bearing and thrust bearing and 2) a blade which is monolithic with a shaft, wherein the thrust bearing uses the sides of the blade as a thrust bearing surfaces and journal bearings uses the shaft as journal bearing surface and wherein the blade is positioned between the two thrust bearings.
- 21) A fluid bearing system for stabilising high speed rotation, characterised in that said bearing system is a combined journal and thrust bearing system, that the thrust bearing uses the sides of the rotating tool as a bearing surface, that the rotating tool being positioned between to two bearings and that the rotating tool is monolithic with the shaft.
- 22) The bearing system of claim 21, used with a combination of self-acting and externally fed fluid film bearings.
- 23) The bearing system of claim 21, used with magnetic bearings.
- 24) The bearing system of claim 21, used with rolling element bearings.
- 25) The system of claim 1 and/or claim 20, wherein the bearings combine both bearing and motor function.
- 26) The apparatus of any of the claims 1 to 2, wherein said rotating tool rotates at at least 10,000 rpm.
- 27) The apparatus of any of the claims 1 to 2, wherein said rotating tool rotates at 20,000 to 100,000 rpm.
- 28) The apparatus of any of the claims 1 to 2, wherein said rotating tool rotates at 40,000 to 100,000 rpm.
- 29) The apparatus of claim 1 or 2, wherein the rotating tool rotates at a surface speed of above between 1 km/min.
- 30) The apparatus of claim 1 or 2, wherein the rotating tool rotates at a surface speed of above 10 km/min.
- 31) The apparatus of claim 1 or 2, wherein the rotating tool rotates at a surface speed 10 km/min to 30 km/min.